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AUTHOR Tom, C. F. Joseph
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ABSTRACT

Money, banking, and macroeconomic textbooks traditionally present the topics of money, the creation of demand deposits by depository institutions, and the Hicksian-Keynesian Theory of Income and Interest separately, as if they were unrelated. This paper presents an integrated approach to those subjects using computer programs written in BASIC, the computer programming language. Three computer programs are described, each annotated with explanations referring to statements in the programs. Program 1 determines the maximum amount of deposits that the depository institute can support. Program 2 demonstrates the Hicksian-Keynesian model of income and interest. Program 3 combines Program 1 and Program 2 to create an integrated analysis providing an opportunity to study changes in the money supply due to changes in the conditions regulating the operations of the depository institutions. It also examines changes in the equilibrium level of income and interest due to changes in the behavior of the general public on cash balance, investment, and savings. Printouts of each computer program and the results of program exercises are included. Possibilities are given for customization and modification of the programs. (APG)

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by

C.F. Joseph Tom

1986

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BASIC Programming for the Integration Of Money, Demand Deposits Creation, and the Hicksian-Keynesian Model

by

C. F. Joseph Tom

Professor of Economics
Lebanon Valley College
Annville, PA 17003

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In the traditional method of presentation on money, banking, and macroeconomics as evidenced in textbooks, the topics of money, the creation of demand deposits by depository institutions, and the Hicksian-Keynesian Theory of Income and Interest are presented separately. And, as if they are not related, there seems to be little attempt to integrate these topics in order to show the overall picture. Yet it is the fact that deposits created and provided by depository institutions constitute a large portion of the total supply of money and that the interaction between supply of and demand for money is a major integral part of the Hicksian-Keynesian analysis. The purpose of this paper therefore is an attempt to present an integrated approach to money, demand deposits created by depository institutions, and the Hicksian-Keynesian model of income and interest with the help of computer programming with BASIC.

Within the limitation of time and space, I shall begin by presenting a computer program for demand deposits creation by depository institutions, follow by showing a program for the Hicksian-Keynesian model, and conclude by unifying the above two programs into one integrated analysis.

I.

Program I (see Illustration 1) is written for determining the maximum amount of deposits that the depository institutions can support. Statements 50 to 144 identify the various factors to be considered in our model.* They include for example, the amount of reserves, the reserve requirements against demand and savings-time deposits, and changes in saving-time deposits and in cash flow resulted from change in demand deposits.

Statements 530 to 660 are for entries of numerical values of each of the factors.

Since our model here does allow the common practice of converting part of the initially created demand deposits into savings-time deposits and cash, the available amount of reserves must support not only the final amount of demand deposits so created but also all the other elements which include the existing demand and saving-time deposits, as well as the additional saving-time deposits and the induced cash outflow resulted from additional demand deposits created. Taking all the above factors into consideration, the computer is so programmed by Statements 740 to 792 to calculate the final maximum additional amount of demand deposits, savings-time deposits, cash flow, and loan extended in the form of demand deposits initially created, as well as the demand deposits multiplier.** Statements 800 to 866 print out the results of the above conditions.

For additional instructional purpose, the computer is further programmed by statements 880 to 909 to print out a T-account. Thus space is

*For convenience in observation, interactions between the computer and the user such as commands given and information entered by the user are underlined in all illustrations whenever appropriate. Also, arrows placed on the left margin pinpointing statements referred to in the text are used.

**This program is also applicable when there is a contraction instead of an expansion of demand deposits.

provided for one to arrange all the above findings into the T-account and to ascertain that the now available amount of reserves after cash flow adjustment is exactly equal to the required amount of reserves for backing up the deposits.

Finally, if money supply is to be defined as the sum of demand deposits and currency belonging to the general public, the maximum total supply of money according to our model would be the sum of existing demand deposits, additional demand deposits, induced cash flow, and the existing currency in circulation. Statements 980 to 1082 provided the computation and printout of these information.

Illustration 2 is the printout of the results of an exercise of Program I performed by the computer for inspection.

II.

Program II (see Illustration 3) is for the Hicksian-Keynesian model of income and interest, Statements 6010 to 6510 outline the basic variables to be considered. They are the supply of money, transactional and asset demand for money, the investment function, and the savings function. Within these parameters, numerical values for each of the above factors are to be entered into the computer as programmed by Statements 6700 to 7230. With these given data, Statements 7300 to 7654 are for the derivation of linear equations for supply of money, demand for money, investment, savings, the money market equilibrium condition (L=M), the real market equilibrium condition (I=S), as well as the solutions for income and interest by the method of determinants.

Finally, Statements 7700 to 7920 are to instruct the computer to printout the various equations and the answers for the equilibrium national income and interest.

Illustration 4 is the printout of the results of an excerise of Program II performed by the computer for reference.

III.

Up to this point, two separate and independent programs--one for demand deposits creation and the total supply of money and the other for the Hicksian-Keynesian model of income and interest--have been presented. As from both the factual and analytical points of view, demand deposits, the total money supply, and the Hicksian-Keynesian model are very closely related. The purpose of Program III is therefore to unify Program I and Program II for an integrated analysis.

The process and rationale of integration is simple and straight forward. Program III is the combination of Program I and Program II with one major modification. Instead of assuming an arbitrary value for the supply of money as in Program II, the value of the money supply in the integrated Program III is no longer arbitrarily assigned but is determined by the conditions in the community of the depository institutions as outlined in Program I.

In other words, the causal relationship between (a) changes in any one of the factors considered in Program I that could affect the total supply of money and (b) the determination of the equilibrium level of national income and interest by Program II can now be evaluated by the integrated analysis in Program III. Study on the change in the supply of money due to change(s) in conditions regulating the operations of the depository institutions on the one hand and study on the change in equilibrium level of income and interest due to change(s) in the behavior of the general public on cash balance, investment, and savings decisions on the other are no longer two separate entities but one unifying analysis.

Thus under the integrated approach, the equilibrium level of national income and its corresponding equilibrium rate of interest are to be determined

by the simultaneous interaction of all the following factors:

(1) the amount of reserves available which could affect the money supply and are subject to the monetary actions of the central bank,

(2) the reserve requirements against deposits which are also subject to the policy of the central bank,

(3) the desired proportional allocation between demand deposits, savings-time deposits, and currency that the general public decides to maintain,

(4) the amount of deposits and currency that the general public holds at any given moment of time, e.g., its cash balance for transactional and asset purposes,

(5) the desire of the business community for investment at different rates of interest, and

(6) the decisions of households, businesses, and government units for savings at various level of income.

As presented in Illustration 5, Program III is the integration of Program I and Program II. Statements 30 to 1082 are identical with those statements in Program I. And statements 6100 to 7920 in Program III are identical with those in Program II. Statements 4000 to 4050 are connecting statements to bring Program I and Program II together. Illustration 6 is the printout of the results of the combined exercise of Program I and Program II under Program III performed by the computer for review.

IV.

In conclusion, I would like to make two comments. First, whatever I have done so far with the hope for a better pedagogy in economics is only a very modest beginning when applying computer programming for an

integrated analysis in money, demand deposits creation, and the Hicksian-Keynesian model of income and interest. Based on the above attempts, more sophisticated models can be built. Let me suggest only three possibilities.

(a) By applying the loop arrangements (FOR-NEXT commands) on each of the factors involved, a program can be constructed to show the effects of changes in any combinations of variables upon any results under investigation, such as, among others, the maximum permissible extension of loan in the form of demand deposits, the total supply of money, and/or the equilibrium level of income and interest.

(b) Another possibility is to evaluate the required amount of total money supply in order to achieve a predetermined goal of certain equilibrium level of income and interest.

((c) A further suggestion is to make explicit in the savings function by separating the total savings into personal savings, business savings, and governmental savings. By doing so, the effects of governmental fiscal policies and actions in expenditures, taxation, and deficit financing upon income and interest can be analyzed.

Second, I wish to express my appreciation to the Eastern Economic Association for inviting me to share my experience with you. My attempt is a modest one, and there is still a great deal of room for development in the application of computer programming in economics for better instruction and research. It is my sincere hope that others will join me to push this new frontier forward. I am most eager and grateful to receive your helpful comments and suggestion.

Thank you.

12 April 1986
Philadelphia, PA

ILLUSTRATION I

Program I

```
BKDD    08:25           84.04.11
2 PRINT
10 PRINT "A PROGRAM ON THE CREATION OF DEMAND DEPOSITS BY"
12 PRINT "DEPOSITORY INSTITUTIONS."
18 PRINT "COPYRIGHTED BY C. F. JOSEPH TOM, LVC, JANUARY 3, 1984."
20 PRINT
30 PRINT "TO DETERMINE THE MAXIMUM AMOUNT OF DEPOSITS THAT THE DEPOSITORY "
32 PRINT "INSTITUTIONS CAN SUPPORT, THE FOLLOWING FACTORS ARE TO BE CONSIDERED:"
40 PRINT
50 PRINT "(1) D1: THE FINAL MAXIMUM CHANGE (ADDITION OR SUBTRACTION) OF"
52 PRINT TAB(4); "DEMAND DEPOSITS THAT THE DEPOSITORY INSTITUTIONS CAN SUPPORT."
60 PRINT "(2) A: AMOUNT OF RESERVES."
70 PRINT "(3) R: RESERVE REQUIREMENT AGAINST DEMAND DEPOSITS."
80 PRINT "(4) D2: EXISTING DEMAND DEPOSITS OUTSTANDING."
90 PRINT "(5) K: EXISTING SAVINGS AND TIME DEPOSITS OUTSTANDING."
100 PRINT "(6) G: RESERVE REQUIREMENT AGAINST SAVINGS AND TIME DEPOSITS."
110 PRINT "(7) N: RATIO OF FINAL CHANGE IN SAVINGS AND TIME DEPOSITS"
112 PRINT TAB(4); "RESULTED FROM CHANGE IN DEMAND DEPOSITS TO FINAL CHANGE IN"
114 PRINT TAB(4); "THE MAXIMUM AMOUNT OF DEMAND DEPOSITS THAT THE DEPOSITORY"
116 PRINT TAB(4); "INSTITUTIONS CAN SUPPORT--T/D1."
120 PRINT "(8) T: CHANGE IN SAVINGS AND TIME DEPOSITS RESULTED FROM CHANGE"
122 PRINT TAB(4); "IN DEMAND DEPOSITS CREATED OR ELIMINATED--(T/D1)*D1=N*D1."
130 PRINT "(9) S: RATIO OF FINAL CASH FLOW RESULTED FROM CHANGE IN DEMAND"
132 PRINT TAB(4); "DEPOSITS TO FINAL CHANGE IN THE MAXIMUM AMOUNT OF DEMAND"
134 PRINT TAB(4); "DEPOSITS THAT THE DEPOSITORY INSTITUTIONS"
136 PRINT TAB(4); "CAN SUPPORT--C3/D1."
140 PRINT "(10) C3: CHANGE IN CASH FLOW (OUTFLOW FROM OR INFLOW INTO THE"
142 PRINT TAB(5); "DEPOSITORY INSTITUTIONS) RESULTED FROM CHANGE IN DEMAND"
144 PRINT TAB(5); "DEPOSITS--(C3/D1)*D1=S*D1."
500 PRINT
510 PRINT "NOW ENTER THE GIVEN INFORMATION AS FOLLOWS:"
520 PRINT
530 PRINT TAB(2); "INPUT A";
540 INPUT A
550 PRINT TAB(2); "INPUT R";
560 INPUT R
570 PRINT TAB(2); "INPUT D2";
580 INPUT D2
590 PRINT TAB(2); "INPUT K";
600 INPUT K
610 PRINT TAB(2); "INPUT G";
620 INPUT G
630 PRINT TAB(2); "INPUT N";
640 INPUT N
650 PRINT TAB(2); "INPUT S";
660 INPUT S

Ready
```

ILLUSTRATION I

Program I

```
BKDD    08:27           84.04.11
670 PRINT
680 PRINT "TAKING INTO ACCOUNT OF THE ABOVE VARIABLES, THE EQUATION TO FIND "
682 PRINT "THE FINAL MAXIMUM CHANGE (ADDITION OR SUBTRACTION) OF DEMAND"
684 PRINT "DEPOSITS THAT THE DEPOSITORY INSTITUTIONS CAN CREATE AND"
686 PRINT "SUPPORT WOULD BE:"
710 PRINT
720 PRINT TAB(4); "D1=(A-D2*R-K*G)/(R+N*G+S)"
722 IF (R+N*G+S)<1 THEN 738
726 IF (R+N*G+S)>1 THEN 730
730 PRINT
732 PRINT "PLEASE NOTE: SINCE (R+N*G+S) CANNOT BE LARGER THAN ONE,"
733 PRINT "PLEASE TRY AGAIN."
735 GOTO 500
738 PRINT
740 LET D1=(A-D2*R-K*G)/(R+N*G+S)
750 LET D1=INT(10*D1+.5)/10
760 LET T=D1*N
765 LET T=INT(10*T+.5)/10
770 LET C3=D1*S
775 LET C3=INT(10*C3+.5)/10
780 LET L=D1+T+C3
785 REM "L=THE MAXIMUM AMOUNT OF LOAN IN THE FORM OF DEMAND DEPOSITS"
787 REM "THAT THE DEPOSITORY INSTITUTIONS CAN EXTEND."
790 LET W=1/(R+N*G+S)
792 REM "W=DEMAND DEPOSITS MULTIPLIER."
800 PRINT "BASED ON THE ABOVE CONDITIONS, THE FOLLOWING RESULTS CAN BE "
802 PRINT "FOUND:"
810 PRINT
820 PRINT TAB(2); "(1) THE FINAL MAXIMUM CHANGE OF DEMAND DEPOSITS THAT"
822 PRINT TAB(6); "THE DEPOSITORY INSTITUTIONS CAN SUPPORT IS--$";D1
830 PRINT
840 PRINT TAB(2);"(2) THE FINAL CHANGE IN SAVINGS AND TIME DEPOSITS'
842 PRINT TAB(6); "RESULTED FROM CHANGE IN DEMAND DEPOSITS IS--$";T
850 PRINT
852 PRINT TAB(2) "(3) THE FINAL  CHANGE IN CASH FLOW  RESULTED FROM CHANGE"
856 PRINT TAB(6); "ILN DEMAND DEPOSITS IS--$";C3
858 PRINT
860 PRINT TAB(2); "(4) THE MAXIMUM AMOUNT OF LOAN IN THE FORM OF DEMAND"
862 PRINT TAB(6); "DEPOSITS THAT THE DEPOSITORY INSTITUTIONS CAN EXTEND IS--$";L
864 PRINT
866 PRINT TAB(2); "(5) THE DEMAND DEPOSITS MULTIPLIER WOULD BE--"; W
870 PRINT
880 PRINT "TO PROVE THAT THE ABOVE FINDINGS ARE CORRECT, ARRANGE"
882 PRINT "ALL THE RELEVANT INFORMATION IN A T-ACCOUNT AND"
884 PRINT "ASCERTAIN THAT THE AVAILABLE AMOUNT OF RESERVES IS EXACTLY EQUAL"
885 PRINT "TO THE REQUIRED AMOUNT OF RESERVES TO BACK UP ALL THE DEPOSITS."
886 PRINT
888 PRINT "------------------------------------------------------------"
890 PRINT TAB(29); "|"
891 PRINT TAB(29); "|"
892 PRINT TAB(29); "|"

Ready
```

ILLUSTRATION 1

Program I

```
BKDD    08:28            84.04.11
 893 PRINT TAB(29);"|"
 894 PRINT TAB(29);"|"
 895 PRINT TAB(29);"|"
 896 PRINT TAB(29);"|"
 897 PRINT TAB(29);"|"
 898 PRINT TAB(29);"|"
 900 PRINT TAB(29);"|"
 901 PRINT TAB(29);"|"
 902 PRINT TAB(29);"|"
 903 PRINT TAB(29);"|"
 904 PRINT TAB(29);"|"
 905 PRINT TAB(29);"|"
 906 PRINT TAB(29);"|"
 907 PRINT TAB(29);"|"
 908 PRINT TAB(29);"|"
 909 PRINT TAB(29);"|"
 915 PRINT
 980 PRINT "IF WE DEFINE THE SUPPLY OF MONEY AS THE SUM OF DEMAND"
 990 PRINT "DEPOSITS AND CURRENCY OUTSIDE OF THE TREASURY, FEDERAL"
 992 PRINT "RESERVE BANKS, AND COMMERCIAL BANKS AND OTHER DEPOSITORY"
 994 PRINT "INSTITUTIONS, WE NEED TO KNOW THE AMOUNT OF CURRENCY BEFORE CASH"
 996 PRINT "FLOW EITHER INTO OR OUT OF THE DEPOSITORY INSTITUTIONS RESULTED"
 998 PRINT "FROM CHANGE IN DEMAND DEPOSITS."
1010 PRINT
1020 PRINT "IF WE ASSUME THAT THE AMOUNT OF CURRENCY AVAILABLE TO THE"
1022 PRINT "GENERAL PUBLIC FOR USE BEFORE CASH FLOW TO BE $";
1030 INPUT C1
1040 LET C=C1+C3
1050 LET D=D1+D2
1060 LET X=C+D
1070 PRINT
1076 PRINT "THEN WITH THE ABOVE INFORMATION ON DEMAND DEPOSITS AND"
1080 PRINT "CURRENCY, THE TOTAL SUPPLY OF MONEY WOULD BE $"; X; ","
1082 PRINT "OF WHICH $"; D; "IS DEMAND DEPOSITS, AND $"; C; "IS CURRENCY."
1090 PRINT
1100 PRINT "DO YOU WANT TO ENTER NEW DATA, YES OR NO?";
1110 INPUT A$
1120 IF A$="YES" THEN 500
1130 IF A$="NO" THEN 32767
32767 END

Ready
```

ILLUSTRATION 2

```
RUN
BKDD    08:35            84.04.11

A PROGRAM ON THE CREATION OF DEMAND DEPOSITS BY
DEPOSITORY INSTITUTIONS.
COPYRIGHTED BY C. F. JOSEPH TOM, LVC, JANUARY 3, 1984.

TO DETERMINE THE MAXIMUM AMOUNT OF DEPOSITS THAT THE DEPOSITORY
INSTITUTIONS CAN SUPPORT, THE FOLLOWING FACTORS ARE TO BE CONSIDERED:

(1) D1: THE FINAL MAXIMUM CHANGE (ADDITION OR SUBTRACTION) OF
    DEMAND DEPOSITS THAT THE DEPOSITORY INSTITUTIONS CAN SUPPORT.
(2) A: AMOUNT OF RESERVES.
(3) R: RESERVE REQUIREMENT AGAINST DEMAND DEPOSITS.
(4) D2: EXISTING DEMAND DEPOSITS OUTSTANDING.
(5) K: EXISTING SAVINGS AND TIME DEPOSITS OUTSTANDING.
(6) G: RESERVE REQUIREMENT AGAINST SAVINGS AND TIME DEPOSITS.
(7) N: RATIO OF FINAL CHANGE IN SAVINGS AND TIME DEPOSITS
    RESULTED FROM CHANGE IN DEMAND DEPOSITS TO FINAL CHANGE IN
    THE MAXIMUM AMOUNT OF DEMAND DEPOSITS THAT THE DEPOSITORY
    INSTITUTIONS CAN SUPPORT--T/D1.
(8) T: CHANGE IN SAVINGS AND TIME DEPOSITS RESULTED FROM CHANGE
    IN DEMAND DEPOSITS CREATED OR ELIMINATED--(T/D1)*D1=N*D1.
(9) S: RATIO OF FINAL CASH FLOW RESULTED FROM CHANGE IN DEMAND
    DEPOSITS TO FINAL CHANGE IN THE MAXIMUM AMOUNT OF DEMAND
    DEPOSITS THAT THE DEPOSITORY INSTITUTIONS
    CAN SUPPORT--C3/D1.
(10) C3: CHANGE IN CASH FLOW (OUTFLOW FROM OR INFLOW INTO THE
     DEPOSITORY INSTITUTIONS) RESULTED FROM CHANGE IN DEMAND
     DEPOSITS--(C3/D1)*D1=S*D1.

NOW ENTER THE GIVEN INFORMATION AS FOLLOWS:'

  INPUT A?  20
  INPUT R?  .1
  INPUT D2?  40
  INPUT K?  120
  INPUT G?  .05
  INPUT N?  3
  INPUT S?  .1

TAKING INTO ACCOUNT OF THE ABOVE VARIABLES, THE EQUATION TO FIND
THE FINAL MAXIMUM CHANGE (ADDITION OR SUBTRACTION) OF DEMAND
DEPOSITS THAT THE DEPOSITORY INSTITUTIONS CAN CREATE AND
SUPPORT WOULD BE:

    D1=(A-D2*R-K*G)/(R+N*G+S)

BASED ON THE ABOVE CONDITIONS, THE FOLLOWING RESULTS CAN BE
FOUND:

  (1) THE FINAL MAXIMUM CHANGE OF DEMAND DEPOSITS THAT
      THE DEPOSITORY INSTITUTIONS CAN SUPPORT IS--$ 28.6

  (2) THE FINAL CHANGE IN SAVINGS AND TIME DEPOSITS'
      RESULTED FROM CHANGE IN DEMAND DEPOSITS IS--$ 85.8
```

ILLUSTRATION 2

(3) THE FINAL CHANGE IN CASH FLOW RESULTED FROM CHANGE ILN DEMAND DEPOSITS IS--$ 2.9

(4) THE MAXIMUM AMOUNT OF LOAN IN THE FORM OF DEMAND DEPOSITS THAT THE DEPOSITORY INSTITUTIONS CAN EXTEND IS--$ 117.3

(5) THE DEMAND DEPOSITS MULTIPLIER WOULD BE-- 2.85714

TO PROVE THAT THE ABOVE FINDINGS ARE CORRECT, ARRANGE ALL THE RELEVANT INFORMATION IN A T-ACCOUNT AND ASCERTAIN THAT THE AVAILABLE AMOUNT OF RESERVES IS EXACTLY EQUAL TO THE REQUIRED AMOUNT OF RESERVES TO BACK UP ALL THE DEPOSITS.

IF WE DEFINE THE SUPPLY OF MONEY AS THE SUM OF DEMAND DEPOSITS AND CURRENCY OUTSIDE OF THE TREASURY, FEDERAL RESERVE BANKS, AND COMMERCIAL BANKS AND OTHER DEPOSITORY INSTITUTIONS, WE NEED TO KNOW THE AMOUNT OF CURRENCY BEFORE CASH FLOW EITHER INTO OR OUT OF THE DEPOSITORY INSTITUTIONS RESULTED FROM CHANGE IN DEMAND DEPOSITS.

IF WE ASSUME THAT THE AMOUNT OF CURRENCY AVAILABLE TO THE GENERAL PUBLIC FOR USE BEFORE CASH FLOW TO BE $? 4

THEN WITH THE ABOVE INFORMATION ON DEMAND DEPOSITS AND CURRENCY, THE TOTAL SUPPLY OF MONEY WOULD BE $ 75.5 , OF WHICH $ 68.6 IS DEMAND DEPOSITS, AND $ 6.9 IS CURRENCY.

DO YOU WANT TO ENTER NEW DATA, YES OR NO?? NO

Ready

ILLUSTRATION 3

Program II

```
OLD
Old file name--HIKE01

Ready

LIST 6000-7050
HIKE01  08:38            84.04.11
6000 PRINT 'THE HICKSIAN-KEYNESIAN MODEL OF INCOME AND INTEREST.'
6002 PRINT 'COPYRIGHT: C. F. JOSEPH TOM, LEBANON VALLEY COLLEGE,'
6004 PRINT 'ANNVILLE, PA. 17003, 3 JANUARY 1984.'
6010 PRINT
6020 PRINT 'TO DETERMINE THE EQUILIBRIUM LEVEL OF NATIONAL INCOME AND ITS'
6030 PRINT 'CORRESPONDING EQUILIBRIUM RATE OF INTEREST, THE FOLLOWING'
6040 PRINT 'FACTORS ARE TO BE CONSIDERED:'
6090 PRINT
6100 PRINT TAB(2); '(1) THE SUPPLY OF MONEY, M.'
6110 PRINT
6200 PRINT TAB(2); '(2) THE TRANSACTIONAL DEMAND FOR MONEY, L1, WHICH '
6210 PRINT TAB(6); 'DEPENDS UPON THE PERCENT OF NATIONAL INCOME, Y, THAT THE'
6220 PRINT TAB(6); 'GENERAL PUBLIC WOULD DESIRE TO HOLD AS CASH BALANCE, J, FOR'
6224 PRINT TAB(6); 'TRANSACTIONAL PURPOSES.'
6250 PRINT
6300 PRINT TAB(2); '(3) THE ASSET DEMAND FOR MONEY, L2, WHICH IS THE'
6310 PRINT TAB(6); 'FUNCTION OF INTEREST RATE, R.'
6350 PRINT
6400 PRINT TAB(2); '(4) THE DEMAND FOR INVESTMENT, I, WHICH IS THE'
6410 PRINT TAB(6); 'FUNCTION OF INTEREST RATE, R.'
6450 PRINT
6500 PRINT TAB(2); '(5) THE SUPPLY OF SAVINGS, S, WHICH DEPENDS UPON'
6510 PRINT TAB(6); 'THE LEVEL OF NATIONAL INCOME, Y.'
6550 PRINT
6600 PRINT 'AFTER TAKING INTO CONSIDERATION OF ALL THE ABOVE FACTORS,'
6610 PRINT 'THE EQUILIBRIUM LEVEL OF NATIONAL INCOME AND INTEREST RATE'
6620 PRINT 'WILL BE ESTABLISHED WHEN BOTH (1) SUPPLY OF MONEY EQUALS'
6630 PRINT 'DEMAND FOR MONEY IN THE MONEY MARKET AND (2) DEMAND'
6640 PRINT 'FOR INVESTMENT EQUALS SUPPLY OF SAVINGS IN THE REAL MARKET.'
6680 PRINT
6700 PRINT 'BASED ON THE HICKSIAN-KEYNESIAN MODEL, LET US NOW ENTER'
6710 PRINT 'RELEVANT DATA FOR THE DETERMINATION OF THE EQUILIBRIUM INCOME'
6720 PRINT 'AND INTEREST:'
6750 PRINT
6800 PRINT TAB(2); '(1) INPUT M, THE SUPPLY OF MONEY--';
6810 INPUT M
6820 PRINT
6900 PRINT TAB(2); '(2) INPUT J, PERCENT OF INCOME TO BE HELD AS'
6910 PRINT TAB(6); 'CASH FOR TRANSACTIONAL PURPOSES--';
6920 INPUT J
6930 PRINT
7000 PRINT TAB(2); '(3) INPUT R5, L5, AND R6,L6, REPRESENTING TWO'
7010 PRINT TAB(6); 'PAIRS OF DATA SHOWING TWO LEVELS OF INTEREST RATE,'
7020 PRINT TAB(6); 'R5 AND R6, AND THEIR CORRESPONDING AMOUNT OF CASH'
7030 PRINT TAB(6); 'BALANCE, L5 AND L6, AS ASSETS--';
7050 INPUT R5;L5;R6;L6

Ready
```

ILLUSTRATION 3

Program II

```
LIST 7060-7600
HIKE01  08:39            84.04.11
 7060 PRINT
 7100 PRINT TAB(2); '(4) INPUT R7,I7, AND R8, I8, REPRESENTING TWO PAIRS OF'
 7110 PRINT TAB(6); 'DATA SHOWING TWO LEVELS OF INTEREST RATES, R7 AND R8, AND'
 7120 PRINT TAB(6); 'THEIR CORRESPONDING AMOUNT OF INVESTMENT, I7 AND I8--';
 7150 INPUT R7;I7;R8;I8
 7160 PRINT
 7200 PRINT TAB(2); '(5) INPUT Y5, S5, AND Y6, S6, REPRESENTING TWO PAIRS'
 7210 PRINT TAB(6); 'OF DATA SHOWING TWO LEVELS OF NATIONAL INCOME,Y5 AND Y6,'
 7220 PRINT TAB(6); 'AND THEIR CORRESPONDING AMOUNT OF SAVINGS, S5 AND S6,--';
 7230 INPUT Y5;S5;Y6;S6
 7260 PRINT
 7300 REM 'THE FOLLOWING LET STATEMENTS ARE FOR CALCULATION OF EQUATIONS'
 7310 REM 'FOR M, L1, L2, L, I, S, L=M, I=S, EQUILIBRIUM INCOME'
 7320 REM 'AND EQUILIBRIUM INTEREST.'
 7400 LET M=M
 7410 LET L1=J*Y
 7420 REM 'Z IS SLOPE OF L2 CURVE..'
 7430 LET Z=(L5-L6)/(R5-R6)
 7440 LET L2=(L5-Z*R5)+Z*R
 7450 LET L=L1+L2
 7460 REM 'THE MONEY MARKET EQUILITRIUM EQUATION WHEN L=M IS:'
 7462 REM 'J*Y+Z*R=M-L5+Z*R5.'
 7470 LET E=M-L5+Z*R5
 7472 REM 'THUS L=M IS: J*Y+Z*R=E.'
 7480 REM 'F IS SLOPE OF THE INVESTMENT FUNCTION.'
 7490 LET F=(I7-I8)/(R7-R8)
 7500 REM '(I7-F*R7) IS THE INVESTMENT INTERCEPT OF THE EQUATION '
 7505 REM 'FOR THE INVESTMENT FUNCTION.'
 7510 LET F9=I7-F*R7
 7520 REM 'W IS THE SLOPE OF THE SAVINGS FUNCTION.'
 7530 LET W=(S5-S6)/(Y5-Y6)
 7540 REM '(S5-W*Y5) IS THE SAVINGS INTERCEPT OF THE EQUATION FOR'
 7542 REM 'THE SAVINGS FUNCTION.'
 7550 LET S9=S5-W*Y5
 7560 REM 'THE REAL MARKET EQUILIBRIUM WHEN I=S IS:'
 7562 REM 'W*Y-F*R=I7-F*R7-S5+W*Y5.'
 7570 LET B=I7-F*R7-S5+W*Y5
 7572 REM 'THUS I=S IS: W*Y-F*R=B.'
 7580 REM 'THE FOLLOWING LET STATEMENTS ARE RELATED TO MEHTOD OF SOLUTIONS'
 7582 REM 'FOR INCOME AND INTEREST BY DETERMINANTS.'
 7590 LET X1=E*(-F)-B*Z
 7600 LET X2=J*B-W*E

Ready
```

ILLUSTRATION 3

Program II

```
LIST 7610-32767
HIKE01  08:40            84.04.11
7610 LET X3=J*(-F)-W*Z
7614 LET Y=X1/X3
7615 LET Y=INT(10*Y+.5)/10
7616 IF Y>0 THEN 7630
7618 IF Y=0 <0 THEN 7620
7620 PRINT 'ASSUMING NON-NEGATIVITY OF NATIONAL INCOME (Y),'
7622 PRINT 'PLEASE TRY AGAIN.'
7624 GOTO 6700
7630 LET R=X2/X3
7632 LET R=INT(10*R+.5)/10
7640 IF R>0 THEN 7700
7644 IF R=0 <0 THEN 7650
7650 PRINT 'ASSUMING NON-NEGATIVITY OF INTEREST RATE (R),'
7652 PRINT 'PLEASE TRY AGAIN.'
7654 GOTO 6700
7700 PRINT 'BASED ON THE ABOVE GIVEN DATA, WE NOW CAN HAVE EQUATIONS FOR:'
7710 PRINT
7720 PRINT TAB(2); '(1) M=';M;': MONEY SUPPLY.'
7730 PRINT
7740 PRINT TAB(2); '(2) L1=';J;'*Y: TRANSACTIONAL DEMAND FOR CASH BALANCE.'
7780 PRINT
7790 PRINT TAB(2); '(3) L2=';L5-Z*R5;'+';Z;'*R: ASSET DEMAND FOR CASH BALANCE.'
7800 PRINT
7810 PRINT TAB(2); '(4) I=';F9;'+';F;'*R: THE INVESTMENT FUNCTION.'
7820 PRINT
7830 PRINT TAB(2); '(5) S=';S9;'+';W;'*Y: THE SAVINGS FUNCTION.'
7840 PRINT
7850 PRINT TAB(2); '(6) ';J;'*Y+';Z;'*R=';E;': THE MONEY MARKET EQUILIBRIUM'
7852 PRINT TAB(6); 'CONDITION WHEN L=M.'
7860 PRINT
7870 PRINT TAB(2); '(7) ';W;'*Y-';F;'*R=';B;': THE REAL MARKET EQUILIBRIUM'
7872 PRINT TAB(6); 'CONDITION WHEN I=S.'
7880 PRINT
7890 PRINT 'BASED ON THE ABOVE GIVEN CONDITIONS, WE CAN DETERMINE THAT:'
7892 PRINT
7894 PRINT TAB(2); 'WITH THE MAXIMUM MONEY SUPPLY OF $';M;','
7896 PRINT
7900 PRINT TAB(2); 'THE EQUILIBRIUM NATIONAL INCOME WOULD BE: $';Y;', AND'
7910 PRINT
7920 PRINT TAB(2); 'THE EQUILIBRIUM RATE OF INTEREST WOULD BE:';R;'%.'
7930 PRINT
7940 PRINT 'DO YOU WANT TO INTRODUCE NEW DATA? YES? NO?'
7950 INPUT C$
7960 IF C$='YES' THEN 8000
7970 IF C$='NO' THEN 32767
8000 PRINT
8010 PRINT 'PLEASE ENTER NEW DATA:'
8020 PRINT
8030 GOTO 6800
32767 END

Ready
```

ILLUSTRATION 4

```
RUN
HIKE01  08:50            84.04.11
THE HICKSIAN-KEYNESIAN MODEL OF INCOME AND INTEREST.
COPYRIGHT: C. F. JOSEPH TOM, LEBANON VALLEY COLLEGE,
ANNVILLE, PA. 17003, 3 JANUARY 1984.

TO DETERMINE THE EQUILIBRIUM LEVEL OF NATIONAL INCOME AND ITS
CORRESPONDING EQUILIBRIUM RATE OF INTEREST, THE FOLLOWING
FACTORS ARE TO BE CONSIDERED:

  (1) THE SUPPLY OF MONEY, M.

  (2) THE TRANSACTIONAL DEMAND FOR MONEY, L1, WHICH
      DEPENDS UPON THE PERCENT OF NATIONAL INCOME, Y, THAT THE
      GENERAL PUBLIC WOULD DESIRE TO HOLD AS CASH BALANCE, J, FOR
      TRANSACTIONAL PURPOSES.

  (3) THE ASSET DEMAND FOR MONEY, L2, WHICH IS THE
      FUNCTION OF INTEREST RATE, R.

  (4) THE DEMAND FOR INVESTMENT, I, WHICH IS THE
      FUNCTION OF INTEREST RATE, R.

  (5) THE SUPPLY OF SAVINGS, S, WHICH DEPENDS UPON
      THE LEVEL OF NATIONAL INCOME, Y.

AFTER TAKING INTO CONSIDERATION OF ALL THE ABOVE FACTORS,
THE EQUILIBRIUM LEVEL OF NATIONAL INCOME AND INTEREST RATE
WILL BE ESTABLISHED WHEN BOTH (1) SUPPLY OF MONEY EQUALS
DEMAND FOR MONEY IN THE MONEY MARKET AND (2) DEMAND
FOR INVESTMENT EQUALS SUPPLY OF SAVINGS IN THE REAL MARKET.

BASED ON THE HICKSIAN-KEYNESIAN MODEL, LET US NOW ENTER
RELEVANT DATA FOR THE DETERMINATION OF THE EQUILIBRIUM INCOME
AND INTEREST:

  (1) INPUT M, THE SUPPLY OF MONEY--? 75.5

  (2) INPUT J, PERCENT OF INCOME TO BE HELD AS
      CASH FOR TRANSACTIONAL PURPOSES--? .1

  (3) INPUT R5, L5, AND R6,L6, REPRESENTING TWO
      PAIRS OF DATA SHOWING TWO LEVELS OF INTEREST RATE,
      R5 AND R6, AND THEIR CORRESPONDING AMOUNT OF CASH
      BALANCE, L5 AND L6, AS ASSETS--? 3,35,2,40
```

ILLUSTRATION 4

```
   (4) INPUT R7,I7, AND R8, I8, REPRESENTING TWO PAIRS OF
       DATA SHOWING TWO LEVELS OF INTEREST RATES, R7 AND R8, AND
       THEIR CORRESPONDING AMOUNT OF INVESTMENT, I7 AND I8--? 2,50,4,30

   (5) INPUT Y5, S5, AND Y6, S6, REPRESENTING TWO PAIRS
       OF DATA SHOWING TWO LEVELS OF NATIONAL INCOME,Y5 AND Y6,
       AND THEIR CORRESPONDING AMOUNT OF SAVINGS, S5 AND S6,--? 100,10,300,50

BASED ON THE ABOVE GIVEN DATA, WE NOW CAN HAVE EQUATIONS FOR:

   (1) M= 75.5 : MONEY SUPPLY.

   (2) L1= .1 *Y: TRANSACTIONAL DEMAND FOR CASH BALANCE.

   (3) L2= 50 +-5 *R: ASSET DEMAND FOR CASH BALANCE.

   (4) I= 70 +-10 *R: THE INVESTMENT FUNCTION.

   (5) S=-10 + .2 *Y: THE SAVINGS FUNCTION.

   (6)  .1 *Y+-5 *R= 25.5 : THE MONEY MARKET EQUILIBRIUM
       CONDITION WHEN L=M.

   (7)  .2 *Y--10 *R= 80 : THE REAL MARKET EQUILIBRIUM
       CONDITION WHEN I=S.

BASED ON THE ABOVE GIVEN CONDITIONS, WE CAN DETERMINE THAT:

   WITH THE MAXIMUM MONEY SUPPLY OF $ 75.5 ,

   THE EQUILIBRIUM NATIONAL INCOME WOULD BE: $ 327.5 , AND

   THE EQUILIBRIUM RATE OF INTEREST WOULD BE: 1.5 %.

DO YOU WANT TO INTRODUCE NEW DATA? YES? NO?
? NO

Ready
```

ILLUSTRATION 5

Program III

```
OLD
Old file name--EQMYR9
LIST 2-670

Ready

EQMYR9  08:55            84.04.11
 2 PRINT
 8 PRINT "A PROGRAM UNIFYING THE ANALYSIS INVOLVING THE CREATION OF DEMAND"
 10 PRINT "DEPOSITS BY DEPOSITORY INSTITUTIONS, THE SUPPLY OF MONEY, AND"
 12 PRINT "THE HICKSIAN-KEYNESIAN MODEL OF INCOME DETERMINATION."
 14 PRINT "COPYRIGHTED BY C. F. JOSEPH TOM, LVC, 3 JANUARY 1984."
 20 PRINT
 30 PRINT "TO DETERMINE THE MAXIMUM AMOUNT OF DEPOSITS THAT THE DEPOSITORY"
 32 PRINT "INSTITUTIONS CAN SUPPORT, THE FOLLOWING FACTORS ARE TO "
 34 PRINT "BE CONSIDERED:"
 40 PRINT
 50 PRINT "(1) D1: THE FINAL MAXIMUM CHANGE (ADDITION OR SUBTRACTION) OF"
 52 PRINT TAB(4); "DEMAND DEPOSITS THAT THE DEPOSITORY INSTITUTIONS CAN SUPPORT."
 60 PRINT "(2) A: AMOUNT OF RESERVES."
 70 PRINT "(3) R: RESERVE REQUIREMENT AGAINST DEMAND DEPOSITS."
 80 PRINT "(4) D2: EXISTING DEMAND DEPOSITS OUTSTANDING."
 90 PRINT "(5) K: EXISTING SAVINGS AND TIME DEPOSITS OUTSTANDING."
 100 PRINT "(6) G: RESERVE REQUIREMENT AGAINST SAVINGS AND TIME DEPOSITS."
 110 PRINT "(7) N: RATIO OF FINAL CHANGE IN SAVINGS AND TIME DEPOSITS"
 112 PRINT TAB(4); "RESULTED FROM CHANGE IN DEMAND DEPOSITS TO FINAL CHANGE IN"
 114 PRINT TAB(4); "THE MAXIMUM AMOUNT OF DEMAND DEPOSITS THAT THE DEPOSITORY"
 116 PRINT TAB(4); "INSTITUTIONS CAN SUPPORT--T/D1."
 120 PRINT "(8) T: CHANGE IN SAVINGS AND TIME DEPOSITS RESULTED FROM CHANGE"
 122 PRINT TAB(4); "IN DEMAND DEPOSITS CREATED OR ELIMINATED--(T/D1)*D1=N*D1."
 130 PRINT "(9) S: RATIO OF FINAL CASH FLOW RESULTED FROM CHANGE IN DEMAND"
 132 PRINT TAB(4); "DEPOSITS TO FINAL CHANGE IN THE MAXIMUM AMOUNT OF DEMAND"
 134 PRINT TAB(4); "DEPOSITS THAT THE DEPOSITORY INSTITUTIONS"
 136 PRINT TAB(4); "CAN SUPPORT--C3/D1."
 140 PRINT "(10) C3: CHANGE IN CASH FLOW (OUTFLOW FROM OR INFLOW INTO THE"
 142 PRINT TAB(5); "DEPOSITORY INSTITUTIONS) RESULTED FROM CHANGE IN DEMAND"
 144 PRINT TAB(5); "DEPOSITS--(C3/D1)*D1=S*D1."
 500 PRINT
 510 PRINT "NOW ENTER THE GIVEN INFORMATION AS FOLLOWS:'
 520 PRINT
 530 PRINT TAB(2); "INPUT A";
 540 INPUT A
 550 PRINT TAB(2); "INPUT R";
 560 INPUT R
 570 PRINT TAB(2); "INPUT D2";
 580 INPUT D2
 590 PRINT TAB(2); "INPUT K";
 600 INPUT K
 610 PRINT TAB(2); "INPUT G";
 620 INPUT G
 630 PRINT TAB(2); "INPUT N";
 640 INPUT N
 650 PRINT TAB(2); "INPUT S";
 660 INPUT S
 670 PRINT

Ready
```

ILLUSTRATION 5

Program III

```
LIST 680-1070
EQMYR9  08:56              84.04.11
680 PRINT "TAKING INTO ACCOUNT OF THE ABOVE VARIABLES, THE EQUATION TO FIND "
682 PRINT "THE FINAL MAXIMUM CHANGE (ADDITION OR SUBTRACTION) OF DEMAND"
684 PRINT "DEPOSITS THAT THE DEPOSITORY INSTITUTIONS CAN CREATE AND"
688 PRINT "SUPPORT WOULD BE:"
710 PRINT
720 PRINT TAB(4); "D1=(A-D2*R-K*G)/(R+N*G+S)"
722 IF (R+N*G+S)<1 THEN 738
726 IF (R+N*G+S)>1 THEN 730
730 PRINT
732 PRINT "PLEASE NOTE: SINCE (R+N*G+S) CANNOT BE LARGER THAN ONE,"
733 PRINT "PLEASE TRY AGAIN."
735 GOTO 500
738 PRINT
740 LET D1=(A-D2*R-K*G)/(R+N*G+S)
744 LET D1=INT(10*D1+.5)/10
760 LET T=D1*N
764 LET T=INT(10*T+.5)/10
770 LET C3=D1*S
774 LET C3=INT(10*C3+.5)/10
780 LET L=D1+T+C3
785 REM "L=THE MAXIMUM AMOUNT OF LOAN IN THE FORM OF DEMAND DEPOSITS"
787 REM "THAT THE DEPOSITORY INSTITUTIONS CAN EXTEND."
790 LET W=1/(R+N*G+S)
792 REM "W=DEMAND DEPOSITS MULTIPLIER."
800 PRINT "BASED ON THE ABOVE CONDITIONS, THE FOLLOWING RESULTS CAN BE "
802 PRINT "FOUND:"
810 PRINT
820 PRINT TAB(2); "(1) THE FINAL MAXIMUM CHANGE OF DEMAND DEPOSITS THAT"
822 PRINT TAB(6); "THE DEPOSITORY INSTITUTIONS CAN SUPPORT IS--$";D1
830 PRINT
840 PRINT TAB(2);"(2) THE FINAL CHANGE IN SAVINGS AND TIME DEPOSITS'
842 PRINT TAB(6) "RESULTED FROM CHANGE IN DEMAND DEPOSITS IS--$";T
850 PRINT
852 PRINT TAB(2) "(3) THE FINAL  CHANGE IN CASH FLOW  RESULTED FROM CHANGE"
856 PRINT TAB(6); "IN DEMAND DEPOSITS IS--$";C3
858 PRINT
860 PRINT TAB(2); "(4) THE MAXIMUM AMOUNT OF LOAN IN THE FORM OF DEMAND"
862 PRINT TAB(6); "DEPOSITS THAT THE DEPOSITORY INSTITUTIONS CAN EXTEND IS--$";L
864 PRINT
866 PRINT TAB(2); "(5) THE DEMAND DEPOSITS MULTIPLIER WOULD BE--"; W
915 PRINT
980 PRINT "IF WE DEFINE THE SUPPLY OF MONEY (M) AS THE SUM OF DEMAND"
990 PRINT "DEPOSITS AND CURRENCY OUTSIDE OF THE TREASURY, FEDERAL"
992 PRINT "RESERVE BANKS, AND DEPOSITORY INSTITUTIONS, WE NEED TO KNOW THE"
994 PRINT "AMOUNT OF CURRENCY BEFORE CASH FLOW EITHER INTO OR OUT OF THE"
996 PRINT "DEPOSITORY INSTITUTIONS RESULTED FROM CHANGE IN DEMAND DEPOSITS."
1010 PRINT
1020 PRINT "IF WE ASSUME THAT THE AMOUNT OF CURRENCY AVAILABLE TO THE"
1022 PRINT "GENERAL PUBLIC FOR USE BEFORE CASH FLOW TO BE $";
1030 INPUT C1
1040 LET C=C1+C3
1050 LET D=D1+D2
1060 LET M=C+D
1070 PRINT

Ready
```

ILLUSTRATION 5

Program III

```
LIST 1076-7150
EQMYR9  08:57              84.04.11
1076 PRINT 'THEN WITH THE ABOVE INFORMATION ON DEMAND DEPOSITS AND'
1080 PRINT 'CURRENCY, THE MAXIMUM MONEY SUPPLY (M) WOULD BE $' M;',
1082 PRINT 'OF WHICH $'; D; 'IS DEMAND DEPOSITS, AND $'; C; 'IS CURRENCY.'
1090 PRINT
4000 PRINT 'THUS TOGETHER WITH THE ABOVE INFORMATION ON THE SUPPLY OF'
4010 PRINT 'MONEY (M)AND OTHER FINFORMATION ON DEMAND FOR MONEY,INVESTMENT'
4020 PRINT 'FUNCTION, AND SAVINGS FUNCTION, THE EQUILIBRIUM LEVEL OF'
4030 PRINT 'NATIONAL INCOME (Y) AND ITS CORRESPONDING EQUILIBRIUM RATE'
4040 PRINT 'OF INTEREST ACCORDING TO THE HICKSIAN-KEYNESIAN MODAEL'
4050 PRINT 'CAN BE DETERMINED.  EXPLICITLY, THESE INFORMATION ARE:'
4055 PRINT
6100 PRINT TAB(2); '(1) THE SUPPLY OF MONEY, M.'
6110 PRINT
6200 PRINT TAB(2); '(2) THE TRANSACTIONAL DEMAND FOR MONEY, L1, WHICH '
6210 PRINT TAB(6); 'DEPENDS UPON THE PERCENT OF NATIONAL INCOME, Y, THAT THE'
6220 PRINT TAB(6); 'GENERAL PUBLIC WOULD DESIRE TO HOLD AS CASH BALANCE, J, FOR'
6224 PRINT TAB(6); 'TRANSACTIONAL PURPOSES.'
6250 PRINT
6300 PRINT TAB(2); '(3) THE ASSET DEMAND FOR MONEY, L2, WHICH IS THE'
6310 PRINT TAB(6); 'FUNCTION OF INTEREST RATE, R.'
6350 PRINT
6400 PRINT TAB(2); '(4) THE DEMAND FOR INVESTMENT, I, WHICH IS THE'
6410 PRINT TAB(6); 'FUNCTION OF INTEREST RATE, R.'
6450 PRINT
6500 PRINT TAB(2); '(5) THE SUPPLY OF SAVINGS, S, WHICH DEPENDS UPON'
6510 PRINT TAB(6); 'THE LEVEL OF NATIONAL INCOME, Y.'
6550 PRINT
6600 PRINT 'AFTER TAKING INTO CONSIDERATION OF ALL THE ABOVE FACTORS,'
6610 PRINT 'THE EQUILIBRIUM LEVEL OF NATIONAL INCOME AND INTEREST RATE'
6620 PRINT 'WILL BE ESTABLISHED WHEN BOTH (1) SUPPLY OF MONEY EQUALS'
6630 PRINT 'DEMAND FOR MONEY IN THE MONEY MARKET AND (2) DEMAND'
6640 PRINT 'FOR INVESTMENT EQUALS SUPPLY OF SAVINGS IN THE REAL MARKET.'
6680 PRINT
6700 PRINT 'BASED ON THE HICKSIAN-KEYNESIAN MODEL, LET US NOW ENTER'
6710 PRINT 'RELEVANT DATA FOR THE DETERMINATION OF THE EQUILIBRIUM INCOME'
6720 PRINT 'AND INTEREST:'
6750 PRINT
6800 PRINT TAB(2); '(1) INPUT M, THE SUPPLY OF MONEY--?';M
6820 PRINT
6900 PRINT TAB(2); '(2) INPUT J, PERCENT OF INCOME TO BE HELD AS'
6910 PRINT TAB(6); 'CASH FOR TRANSACTIONAL PURPOSES--';
6920 INPUT J
6930 PRINT
7000 PRINT TAB(2); '(3) INPUT R5, L5, AND R6,L6, REPRESENTING TWO'
7010 PRINT TAB(6); 'PAIRS OF DATA SHOWING TWO LEVELS OF INTEREST RATE,'
7020 PRINT TAB(6); 'R5 AND R6, AND THEIR CORRESPONDING AMOUNT OF CASH'
7030 PRINT TAB(6); 'BALANCE, L5 AND L6, AS ASSETS--';
7050 INPUT R5;L5;R6;L6
7060 PRINT
7100 PRINT TAB(2); '(4) INPUT R7,I7, AND R8, I8, REPRESENTING TWO PAIRS OF'
7110 PRINT TAB(6); 'DATA SHOWING TWO LEVELS OF INTEREST RATES, R7 AND R8, AND'
7120 PRINT TAB(6); 'THEIR CORRESPONDING AMOUNT OF INVESTMENT, I7 AND I8--';
7150 INPUT R7;I7;R8;I8

Ready
```

ILLUSTRATION 5

Program III

```
LIST 7160-7654
EQMYR9  09:24            84.04.11
7160 PRINT
7200 PRINT TAB(2); '(5) INPUT Y5, S5, AND Y6, S6, REPRESENTING TWO PAIRS'
7210 PRINT TAB(6); 'OF DATA SHOWING TWO LEVELS OF NATIONAL INCOME,Y5 AND Y6,'
7220 PRINT TAB(6); 'AND THEIR CORRESPONDING AMOUNT OF SAVINGS, S5 AND S6,--';
7230 INPUT Y5;S5;Y6;S6
7260 PRINT
7300 REM 'THE FOLLOWING LET STATEMENTS ARE FOR CALCULATION OF EQUATIONS'
7310 REM 'FOR M, L1, L2, L, I, S, L=M, I=S, EQUILIBRIUM INCOME'
7320 REM 'AND EQUILIBRIUM INTEREST.'
7400 LET M=M
7410 LET L1=J*Y
7420 REM 'Z IS SLOPE OF L2 CURVE..'
7430 LET Z=(L5-L6)/(R5-R6)
7440 LET L2=(L5-Z*R5)+Z*R
7450 LET L=L1+L2
7460 REM 'THE MONEY MARKET EQUILITRIUM EQUATION WHEN L=M IS:'
7462 REM 'J*Y+Z*R=M-L5+Z*R5.'
7470 LET E=M-L5+Z*R5
7472 REM 'THUS L=M IS: J*Y+Z*R=E.'
7480 REM 'F IS SLOPE OF THE INVESTMENT FUNCTION.'
7490 LET F=(I7-I8)/(R7-R8)
7500 REM '(I7-F*R7) IS THE INVESTMENT INTERCEPT OF THE EQUATION '
7505 REM 'FOR THE INVESTMENT FUNCTION.'
7510 LET F9=I7-F*R7
7520 REM 'W IS THE SLOPE OF THE SAVINGS FUNCTION.'
7530 LET W=(S5-S6)/(Y5-Y6)
7540 REM '(S5-W*Y5) IS THE SAVINGS INTERCEPT OF THE EQUATION FOR'
7542 REM 'THE SAVINGS FUNCTION.'
7550 LET S9=S5-W*Y5
7560 REM 'THE REAL MARKET EQUILIBRIUM WHEN I=S IS:'
7562 REM 'W*Y-F*R=I7-F*R7-S5+W*Y5.'
7570 LET B=I7-F*R7-S5+W*Y5
7572 REM 'THUS I=S IS: W*Y-F*R=B.'
7580 REM 'THE FOLLOWING LET STATEMENTS ARE RELATED TO MEHTOD OF SOLUTIONS'
7582 REM 'FOR INCOME AND INTEREST BY DETERMINANTS.'
7590 LET X1=E*(-F)-B*Z
7600 LET X2=J*B-W*E
7610 LET X3=J*(-F)-W*Z
7614 LET Y=X1/X3
7615 LET Y=INT(10*Y+.5)/10
7616 IF Y>0 THEN 7630
7618 IF Y=0 <0 THEN 7620
7620 PRINT 'ASSUMING NON-NEGATIVITY OF NATIONAL INCOME (Y),'
7622 PRINT 'PLEASE TRY AGAIN.'
7624 GOTO 500
7630 LET R=X2/X3
7632 LET R=INT(10*R+.5)/10
7640 IF R>0 THEN 7700
7644 IF R=0 <0 THEN 7650
7650 PRINT 'ASSUMING NON-NEGATIVITY OF INTEREST RATE (R),'
7652 PRINT 'PLEASE TRY AGAIN.'
7654 GOTO 500

Ready
```

ILLUSTRATION 5

Program III

```
LIST 7700-32767
EQMYR9  09:25            84.04.11
7700 PRINT "BASED ON THE ABOVE GIVEN DATA, WE NOW CAN HAVE EQUATIONS FOR:"
7710 PRINT
7720 PRINT TAB(2); "(1) M="; M; ": MONEY SUPPLY."
7730 PRINT
7740 PRINT TAB(2); "(2) L1="; J; "*Y: TRANSACTIONAL DEMAND FOR CASH BALANCE."
7780 PRINT
7790 PRINT TAB(2); "(3) L2="; L5-Z*R5; "+"; Z; "*R: ASSET DEMAND FOR CASH BALANCE."
7800 PRINT
7810 PRINT TAB(2); "(4) I="; F9; "+"; F; "*R: THE INVESTMENT FUNCTION."
7820 PRINT
7830 PRINT TAB(2); "(5) S="; S9; "+"; W; "*Y: THE SAVINGS FUNCTION."
7840 PRINT
7850 PRINT TAB(2); "(6) "; J; "*Y+"; Z; "*R="; E; ": THE MONEY MARKET EQUILIBRIUM"
7852 PRINT TAB(6); "CONDITION WHEN L=M."
7860 PRINT
7870 PRINT TAB(2); "(7) "; W; "*Y-"; F; "*R="; B; ": THE REAL MARKET EQUILIBRIUM"
7872 PRINT TAB(6); "CONDITION WHEN I=S."
7880 PRINT
7890 PRINT "BASED ON THE ABOVE GIVEN CONDITIONS, WE CAN DETERMINE THAT:"
7892 PRINT
7894 PRINT TAB(2); "WITH THE MAXIMUM MONEY SUPPLY OF $"; M; ","
7896 PRINT
7900 PRINT TAB(2); "THE EQUILIBRIUM NATIONAL INCOME WOULD BE: $"; Y; ", AND"
7910 PRINT
7920 PRINT TAB(2); "THE EQUILIBRIUM RATE OF INTEREST WOULD BE:"R; "%."
7930 PRINT
7940 PRINT "DO YOU WANT TO INTRODUCE NEW DATA? YES? NO?"
7950 INPUT C$
7960 IF C$="YES" THEN 8000
7970 IF C$="NO" THEN 32767
8000 PRINT
8010 PRINT "PLEASE ENTER NEW DATA:"
8020 PRINT
8030 GOTO 520
32767 END

Ready
```

ILLUSTRATION 6

```
RUN
EQMYR9  09:34              84.04.11

A PROGRAM UNIFYING THE ANALYSIS INVOLVING THE CREATION OF DEMAND
DEPOSITS BY DEPOSITORY INSTITUTIONS, THE SUPPLY OF MONEY, AND
THE HICKSIAN-KEYNESIAN MODEL OF INCOME DETERMINATION.
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TO DETERMINE THE MAXIMUM AMOUNT OF DEPOSITS THAT THE DEPOSITORY
INSTITUTIONS CAN SUPPORT, THE FOLLOWING FACTORS ARE TO
BE CONSIDERED:

(1) D1: THE FINAL MAXIMUM CHANGE (ADDITION OR SUBTRACTION) OF
    DEMAND DEPOSITS THAT THE DEPOSITORY INSTITUTIONS CAN SUPPORT.
(2) A: AMOUNT OF RESERVES.
(3) R: RESERVE REQUIREMENT AGAINST DEMAND DEPOSITS.
(4) D2: EXISTING DEMAND DEPOSITS OUTSTANDING.
(5) K: EXISTING SAVINGS AND TIME DEPOSITS OUTSTANDING.
(6) G: RESERVE REQUIREMENT AGAINST SAVINGS AND TIME DEPOSITS.
(7) N: RATIO OF FINAL CHANGE IN SAVINGS AND TIME DEPOSITS
    RESULTED FROM CHANGE IN DEMAND DEPOSITS TO FINAL CHANGE IN
    THE MAXIMUM AMOUNT OF DEMAND DEPOSITS THAT THE DEPOSITORY
    INSTITUTIONS CAN SUPPORT--T/D1.
(8) T: CHANGE IN SAVINGS AND TIME DEPOSITS RESULTED FROM CHANGE
    IN DEMAND DEPOSITS CREATED OR ELIMINATED--(T/D1)*D1=N*D1.
(9) S: RATIO OF FINAL CASH FLOW RESULTED FROM CHANGE IN DEMAND
    DEPOSITS TO FINAL CHANGE IN THE MAXIMUM AMOUNT OF DEMAND
    DEPOSITS THAT THE DEPOSITORY INSTITUTIONS
    CAN SUPPORT--C3/D1.
(10) C3: CHANGE IN CASH FLOW (OUTFLOW FROM OR INFLOW INTO THE
     DEPOSITORY INSTITUTIONS) RESULTED FROM CHANGE IN DEMAND
     DEPOSITS--(C3/D1)*D1=S*D1.

NOW ENTER THE GIVEN INFORMATION AS FOLLOWS:'

  INPUT A?  20
  INPUT R?  .1
  INPUT D2?  40
  INPUT K?  120
  INPUT G?  .05
  INPUT N?  3
  INPUT S?  .1

TAKING INTO ACCOUNT OF THE ABOVE VARIABLES, THE EQUATION TO FIND
THE FINAL MAXIMUM CHANGE (ADDITION OR SUBTRACTION) OF DEMAND
DEPOSITS THAT THE DEPOSITORY INSTITUTIONS CAN CREATE AND
SUPPORT WOULD BE:

    D1=(A-D2*R-K*G)/(R+N*G+S)

BASED ON THE ABOVE CONDITIONS, THE FOLLOWING RESULTS CAN BE
FOUND:
```

ILLUSTRATION 6

(1) THE FINAL MAXIMUM CHANGE OF DEMAND DEPOSITS THAT THE DEPOSITORY INSTITUTIONS CAN SUPPORT IS--$ 28.6

(2) THE FINAL CHANGE IN SAVINGS AND TIME DEPOSITS' RESULTED FROM CHANGE IN DEMAND DEPOSITS IS--$ 85.8

(3) THE FINAL CHANGE IN CASH FLOW RESULTED FROM CHANGE IN DEMAND DEPOSITS IS--$ 2.9

(4) THE MAXIMUM AMOUNT OF LOAN IN THE FORM OF DEMAND DEPOSITS THAT THE DEPOSITORY INSTITUTIONS CAN EXTEND IS--$ 117.3

(5) THE DEMAND DEPOSITS MULTIPLIER WOULD BE-- 2.85714

IF WE DEFINE THE SUPPLY OF MONEY (M) AS THE SUM OF DEMAND DEPOSITS AND CURRENCY OUTSIDE OF THE TREASURY, FEDERAL RESERVE BANKS, AND DEPOSITORY INSTITUTIONS, WE NEED TO KNOW THE AMOUNT OF CURRENCY BEFORE CASH FLOW EITHER INTO OR OUT OF THE DEPOSITORY INSTITUTIONS RESULTED FROM CHANGE IN DEMAND DEPOSITS.

IF WE ASSUME THAT THE AMOUNT OF CURRENCY AVAILABLE TO THE GENERAL PUBLIC FOR USE BEFORE CASH FLOW TO BE $? 4

THEN WITH THE ABOVE INFORMATION ON DEMAND DEPOSITS AND CURRENCY, THE MAXIMUM MONEY SUPPLY (M) WOULD BE $ 75.5 , OF WHICH $ 68.6 IS DEMAND DEPOSITS, AND $ 6.9 IS CURRENCY.

THUS TOGETHER WITH THE ABOVE INFORMATION ON THE SUPPLY OF MONEY (M)AND OTHER FINFORMATION ON DEMAND FOR MONEY,INVESTMENT FUNCTION, AND SAVINGS FUNCTION, THE EQUILIBRIUM LEVEL OF NATIONAL INCOME (Y) AND ITS CORRESPONDING EQUILIBRIUM RATE OF INTEREST ACCORDING TO THE HICKSIAN-KEYNESIAN MODAEL CAN BE DETERMINED. EXPLICITLY, THESE INFORMATION ARE:

(1) THE SUPPLY OF MONEY, M.

(2) THE TRANSACTIONAL DEMAND FOR MONEY, L1, WHICH DEPENDS UPON THE PERCENT OF NATIONAL INCOME, Y, THAT THE GENERAL PUBLIC WOULD DESIRE TO HOLD AS CASH BALANCE, J, FOR TRANSACTIONAL PURPOSES.

(3) THE ASSET DEMAND FOR MONEY, L2, WHICH IS THE FUNCTION OF INTEREST RATE, R.

(4) THE DEMAND FOR INVESTMENT, I, WHICH IS THE FUNCTION OF INTEREST RATE, R.

(5) THE SUPPLY OF SAVINGS, S, WHICH DEPENDS UPON THE LEVEL OF NATIONAL INCOME, Y.

AFTER TAKING INTO CONSIDERATION OF ALL THE ABOVE FACTORS, THE EQUILIBRIUM LEVEL OF NATIONAL INCOME AND INTEREST RATE WILL BE ESTABLISHED WHEN BOTH (1) SUPPLY OF MONEY EQUALS DEMAND FOR MONEY IN THE MONEY MARKET AND (2) DEMAND FOR INVESTMENT EQUALS SUPPLY OF SAVINGS IN THE REAL MARKET.

ILLUSTRATION 6

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BASED ON THE HICKSIAN-KEYNESIAN MODEL, LET US NOW ENTER
RELEVANT DATA FOR THE DETERMINATION OF THE EQUILIBRIUM INCOME
AND INTEREST:

  (1) INPUT M, THE SUPPLY OF MONEY--? 75.5

  (2) INPUT J, PERCENT OF INCOME TO BE HELD AS
      CASH FOR TRANSACTIONAL PURPOSES--?  .1

  (3) INPUT R5, L5, AND R6,L6, REPRESENTING TWO
      PAIRS OF DATA SHOWING TWO LEVELS OF INTEREST RATE,
      R5 AND R6, AND THEIR CORRESPONDING AMOUNT OF CASH
      BALANCE, L5 AND L6, AS ASSETS--?  3,35,2,40

  (4) INPUT R7,I7, AND R8, I8, REPRESENTING TWO PAIRS OF
      DATA SHOWING TWO LEVELS OF INTEREST RATES, R7 AND R8, AND
      THEIR CORRESPONDING AMOUNT OF INVESTMENT, I7 AND I8--? 2,50,4,30

  (5) INPUT Y5, S5, AND Y6, S6, REPRESENTING TWO PAIRS
      OF DATA SHOWING TWO LEVELS OF NATIONAL INCOME,Y5 AND Y6,
      AND THEIR CORRESPONDING AMOUNT OF SAVINGS, S5 AND S6,--? 100,10,300,50

BASED ON THE ABOVE GIVEN DATA, WE NOW CAN HAVE EQUATIONS FOR:

  (1) M= 75.5 : MONEY SUPPLY.

  (2) L1= .1 *Y: TRANSACTIONAL DEMAND FOR CASH BALANCE.

  (3) L2= 50 +-5 *R: ASSET DEMAND FOR CASH BALANCE.

  (4) I= 70 +-10 *R: THE INVESTMENT FUNCTION.

  (5) S=-10 + .2 *Y: THE SAVINGS FUNCTION.

  (6)  .1 *Y+-5 *R= 25.5 : THE MONEY MARKET EQUILIBRIUM
      CONDITION WHEN L=M.

  (7)  .2 *Y--10 *R= 80 : THE REAL MARKET EQUILIBRIUM
      CONDITION WHEN I=S.

BASED ON THE ABOVE GIVEN CONDITIONS, WE CAN DETERMINE THAT:

  WITH THE MAXIMUM MONEY SUPPLY OF $ 75.5 ,

  THE EQUILIBRIUM NATIONAL INCOME WOULD BE: $ 327.5 , AND

  THE EQUILIBRIUM RATE OF INTEREST WOULD BE: 1.5 %.

DO YOU WANT TO INTRODUCE NEW DATA? YES? NO?
? NO

Ready
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